

Appl. No. : 10/007,304
Filed : December 5, 2001

REMARKS

Claims 35-37, 39-41 and 43-58 are pending in the present application. Claim 49 has been amended to independent form, including the limitations of Claim 35, from which it previously depended. Similarly, Claims 54 and 58 have been amended to independent form including the limitations of Claim 52 and 55, respectively, from which they previously depended. The corresponding dependent claims have been adjusted appropriately in view of these amendments. Claims 35, 52 and 55 have been cancelled. These amendments do not add new matter.

Claim Rejections Under 35 U.S.C. § 102

Claims 35-37, 39-42, 45, and 52-54 have been rejected under 35 U.S.C. § 102(e) as anticipated by McTeer. Applicants continue to maintain that McTeer does not teach or suggest the presently claimed invention. Nevertheless, in order to facilitate prosecution, Applicants have cancelled independent Claims 35 and 52 and amended Claims 49 and 54 to independent form. The amended claims indicate that the diffusion barrier comprises a first layer of metal nitride, a layer of reactive metal, and a second layer of metal nitride directly contacting and over the layer of reactive metal.

With respect to Claim 49, the Examiner found that McTeer teaches a second layer of metal nitride over the layer of reactive metal at Figure 9 and Col. 15; ll. 12-25. Figure 9 discloses two layers of metal nitride at reference numerals 2 and 2(b). However, as the Examiner will appreciate, the second layer of metal nitride (reference 2(b)) is not directly contacting and over a layer of reactive metal as claimed. Rather, the second layer of metal nitride contacts a copper layer (15). The portion of the specification pointed to by the Examiner describes Fig. 9 and similarly has no teaching of a second layer of metal nitride directly contacting and over a layer of reactive metal. As a result, Applicants submit that Claim 49, as amended, is not anticipated by McTeer. Claims 36-37, 39-41 and 43-48 now depend from Claim 49. Thus, the rejection of these dependent claims should be withdrawn as well.

With respect to independent Claim 50, the Examiner states that McTeer teaches a second layer of metal nitride directly contacting and over the layer of reactive metal. However, the Examiner provides no support for this assertion in the Office Action. As discussed above, Figure 9 and the corresponding portions of the specification do not disclose a second layer of metal

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nitride directly contacting and over the layer of reactive metal. In fact, there is no such teaching in McTeer and Applicants therefore request withdrawal of this rejection.

Similarly, McTeer has teaching or suggestion of a first layer of titanium nitride directly contacting covered by a layer of aluminum and a second layer of titanium nitride directly contacting an aluminum layer and located between the aluminum layer and the copper filler, as recited in independent Claim 54. As a result, Applicants request withdrawal of this rejection as well.

Claim Rejections Under 35 U.S.C. § 103

Claims 43, 44, and 55-58 were rejected under 35 U.S.C. § 103(a) as being unpatentable over McTeer in view of Aoyama (U.S. Patent No. 5,592,024). Claim 43 now depends from Claim 49. As discussed above, McTeer has no teaching or suggestion of a diffusion barrier comprising a first layer of metal nitride directly contacting and covered by a layer of reactive metal and a second layer of metal nitride directly contacting and over the layer of reactive metal. Aoyama does not remedy this deficiency. As a result, Applicants request withdrawal of the rejection of Claims 43 and 44.

As discussed above, Claim 55 has been cancelled and Claim 57 has been amended to independent form including all the limitations of Claim 55. With respect to Claim 57, the Examiner asserts that McTeer teaches a second layer of metal nitride over a layer of silicon and again refers to Figure 9 and Col. 15, ll. 12-25. Applicants respectfully submit that McTeer has teaching or suggestion of the diffusion barrier comprising a first layer of metal nitride directly contacting and covered by a layer of silicon and a second layer of metal nitride directly contacting and over the layer of silicon. Again, Figure 9 discloses a second barrier layer overlying copper fill but has no disclosure of a layer of silicon, much less a second metal nitride layer directly contacting and overlying a silicon layer. As a result, Applicants respectfully request withdrawal of rejection of Claims 56-58.

Claim 53 was rejected under 35 U.S.C. § 103(a) as obvious over McTeer and Aoyama, further in view of Dutta (U.S. No. 2002/64592). Claim 53 now depends from Claim 54. McTeer has no teaching or suggestion of a diffusion barrier comprising a first layer of titanium nitride directly contacting and covered by a layer of aluminum and a second layer of titanium nitride directly contacting the aluminum layer and located between the aluminum layer and the copper

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filler as recited in Claim 54. This deficiency is not made up for by Aoyama or Dutta. As a result, Applicants submit that the rejection of Claim 53 should be withdrawn.

Conclusion

In view of the arguments presented above, Applicants submit that the present application is in condition for allowance. If any issues remain, the Examiner is cordially invited to contact Applicants' representative at the number provided below in order to resolve such issues promptly.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

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By: Adeel Syed Akhtar
Adeel S. Akhtar
Registration No. 41,394
Attorney of Record
Customer No. 20,995
(415) 954-4114

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